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Washington, DC 20544

In the Matter of )  
 )  
Restoring Internet Freedom ) WC Docket No. 17-108

Comments of  
Stephen Satchell, Private citizen  
9350 Double R Blvd, #2217  
Reno NV 89521-3824  
E-mail address at end of this Comment

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## Introduction

The purpose of this early Comment on the draft NRPM is to provide guidance for bringing some of the thinking behind the NRPM closer to the reality of the Internet and Internet marketplace. I would expect that some of the questions in the final published NPRM will incorporate questions in your mind that I bring up in this preliminary document. I fully expect to comment on the version of the NRPM that is published in the Federal Register, when that happens.

I start by asking “What is an ISP? Then I list what I understand are the “talking points” regarding Network Neutrality. After the recitals, I add my commentary to those talking points. After that, I then submit my commentary to the Draft Notice of Proposed Rulemaking. I apologize in advance if the talking points duplicates some of the questions you present in the draft NRPM.

To permit easy discussion by the Commissioners and FCC status, I have put my Comments in outline form, with section numbers. You’ve already noticed the Table of Contents.

## What is an Internet Service Provider (ISP), exactly?

The flip and non-technical answer is “a company, department, or organization that provides Internet services”. Simple, but not very precise, inclusive, or definitive. The FCC's definition, “We [the FCC] believe that Internet service providers [ISPs] offer the 'capability for generating, acquiring, storing, transforming, processing, retrieving, utilizing, or making available information via telecommunications.' ” strays pretty far from *what* an ISP is, and instead enfolds the rest of the Internet market place into its definition. It also fails to provide any basis for identifying the distinction from one ISP to another.

Wikipedia is a little bit more focused and detailed in its definition: “An **Internet service provider (ISP)** is an organization that provides services for accessing and using the [Internet](#).” They then list a number of different types of ISP:

- Access providers ISP
- Mailbox providers
- Hosting ISPs
- Transit ISPs
- Virtual ISPs [read “resellers”]
- Free ISPs
- Wireless ISPs

That's a better start. Let's dig a little deeper, and be more specific.

An Internet service provider is a company, department, or organization that provides one, two, or three of the following sets of services:

- **Network packet switching.** This is where packets sent via the single or aggregated final-mile links and/or uplinks are injected into the Internet proper, and routing happens. Firewall and attack monitoring equipment can live in the network packet switching system to provide protection for the network itself, the application services, and the user.

*Network neutrality principles apply to this service set.*

In almost every case, ISPs provides some form of packet switching and forwarding services, even if it is as simple as a form of local area network with a DSU-based uplink, or a single WiFi access point with a wired uplink, or a mesh network of wireless network nodes connected somehow to an Internet access point

This packet-switching service set can stand alone: inter-exchange ISPs only provide connectivity (but what a *lot* of it) to the Internet, including cross-connects among the Tier-1 and Tier-2 backbone networks.

- **Access service** from a customer to the Internet service provider via a telecommunications data link, usually referred to as an uplink. In residential service, this link is also referred to as “the final mile” (even when the link is longer than that). In business service, this is the uplink from the customer entity's computers or network to the ISP. (Multi-home access, to several of an ISP's offices or to completely different ISPs, is a variation that I won't discuss here.) Many ISPs offering access will aggregate a number of customer uplinks into a single packet stream inbound, and return response packets to the right customers coming back.

*Network neutrality principles apply to this service set.*

A true facilities-based ISP runs wires or fiber to the customer; other ISPs wanting to provide access service can rent facilities from the (monopoly) telephone company, from the (monopoly) cable company, or build a wireless network of some kind – or a mixture of these methods. Then there are those ISPs who still support PSTN dial-up access...

Some ISPs don't aggregate individual customer links into the packet switching network; the ones offering connectivity to downstream customers do.

This service set can stand alone: neighborhood, apartment, and high-rise building ISPs can offer user link aggregation only, exchanging packets with another ISP that offers full routing services to/from the Internet.

- **Applications service(s).** This service set represents the servers operated by the ISP entity to support the applications the customer wants to use. Note that the only difference between a user and an application service is that an application server doesn't require a human being...but it is a node in the network with its own IP address (or addresses), and not embedded in the packet switching network itself. In other words, to the packet-switching layer there is no difference between a customer's link and the app server's link.

*Network neutrality principles do not apply to this service set – absent interference from the packet-switching/access service sets, application services are competitive.*

Web hosting, e-mail, and certain content companies only offer two parts, network packet switching and applications services.

A by-no-means partial list of such applications:

- DNS directory, name-to-address translation, and other translations
- Electronic mail service
- Web services

- Access to locally hosted and/or cached content
- Messaging services
- Search engines
- On line data repositories and databases, such as the FCC's public Comments for WC-17-108, on-line law databases like WestLaw, medical libraries, &c.
- Travel reservation systems
- Special-application services, such as electrical network systems monitors, chemical plant monitors, weather monitors, camera services to monitor roads, and more, lots more.

## **Facilities versus Non-Facilities ISPs – Access Services**

ISPs that provide access services can be divided vertically by whether they have (1) physical facilities (like twisted pair, coax cable, or fiber), (2) utilize another company's physical facilities, or (3) use wireless. In the early days, the vast majority of ISPs used the Public Telephone Switched Network (PSTN) and dedicated lines leased from the telephone companies. With the growth of the cable-TV companies and their physical plant to homes and businesses, that new second wire became useful as a way to provide Internet access.

In prior FCC proceedings, the Commission required that elements of the telephone network be unbundled, so that, for example, ISPs could use the phone company's facilities to make that “last-mile” connection.

No proceedings to date requires cable TV companies “unbundle” access to its physical plant. That said, some cable companies permit non-facilities-based ISPs to resell services to some extent, but *not* to the point where the connection to the customer terminates at the ISP. I have such service. The disadvantage is that the unique services provided by my ISP are not available. Specifically, my IP address is “owned” by the cable company, not my ISP or myself. I have no choice in this matter.

## The Problem With the FCC's Definition of ISP

The problem with the FCC's definition – “*We [the FCC] believe that Internet service providers [ISPs] offer the 'capability for generating, acquiring, storing, transforming, processing, retrieving, utilizing, or making available information via telecommunications.'*” – is that it creates a form of tunnel vision; it assumes that an ISP *must* provide all three types of service sets, and that those services are offered exclusively to individuals in homes.

ISPs are *not* like the telephone companies. ISPs get to pick and chose exactly what services to customers it offers in-house, and what services it provides by outsourcing, particularly when it comes to application services. Further, application services are available on a competitive basis, so that any broadband customer connected via a net-neutrality-conforming ISP can use those competitive services.

The FCC's original vision of the Internet appears to be grounded in the on-line services marketplace of the 80s and early 90s, that marketplace affecting how Internet service providers built their products at the beginning of the Internet Age in order to compete with those established, non-connected services.

At that time, CompuServe, Genie, American On Line (AOL), and offshoots of bulletin board systems offered a number of services, what we now call applications, available via dial-up modems but not interconnected in any significant way outside of each service. (Ignoring ARPANET, FIDO and UUNET, government and university exchange networks, in this discussion.) Access to the Internet in the 80s was initially via dial-up modems connected to nodes at universities; later AOL and the Byte Information Exchange (BIX) and others offered gateways to the Internet. Also, smaller Internet service providers sprang up to provide modem access as well. During the dial-up times, the marketplace saw Web sites springing up like so many mushrooms in a soaked field – even with the slow loading rates.

When broadband pricing started to drop to affordable levels in the 90s, people started to order broadband in their homes, which sparked the growth of the Internet service providers we know today. For those broadband ISPs to compete with the entrenched modem-based services, the ISPs needed to provide comparable applications services as part of a “bundle” to attract customers. Some ISPs felt that, in order to earn back their investment and make a profit on those applications, they had to “de-incentivize” customers from using competing applications.

It's only been in the last decade that broadband speeds on the one hand, and computer/graphics power on the other, allowed for quite acceptable display of television and movie entertainment over the Internet. Customers embraced programs like C-U-See-me for electronic meetings. The early streaming efforts were crude; as the trend continued toward more speed and more compute power, we started to see places like YouTube and its pornographic brothers spring up. Today, Internet streaming represents a significant threat to the cable-TV model, with more and more people “cutting the cord.”

Cable companies, with their monopoly position in cable TV, leverage this legal monopoly by offering broadband over cable. This means that the cable-modem service uses facilities already in place. It also



means that the business office would want to reduce the impact of Internet-based streaming that could potentially take money from the traditional cable-TV method of content delivery.

Meanwhile, the art of providing applications such as e-mail and Web sites have outgrown the ability of the jack-of-all-trades system administrator to handle; in fact, the state of the art has advanced and become quite specialized in each application area. As the Internet marketplace has matured, those companies, departments, and organizations providing Internet service have splintered into, or outsourced to, specialized groups for each type of service.

## Net Neutrality Talking Points

- 1) Parts of the original problem that were to be “solved” by “net neutrality”, as I understand it:
  - 1.1 Discrimination in general (one of the original reasons for Title II classification)
  - 1.2 Extremely limited choice of providers, or in some cases *no* choice in providers, eliminating the customers' ability to “vote with their pocketbook” regarding certain activities and network manipulations. Limits the action of market forces by functional monopoly or duopoly. (Choice, municipal broadband)
  - 1.3 Decouple prudent network management practices from business decisions on the part of other divisions of companies (vertical management) providing broadband service, said decisions being unrelated to providing said broadband service to the customer. (“Fast lanes”, discriminatory traffic prioritization, discriminatory access, elevation of service levels to in-house products and contracted third parties)
  - 1.4 Network operators using only prudent network practices to best move *all* traffic to the sole benefit to customers to the best of the ISPs' ability, without regard to source of the traffic. (Discrimination, impairment to new content providers, innovation)
  - 1.5 Restrictions on the use of virtual private network links, and to encryption in general. (Privacy, “Pay for Privacy”)
  - 1.6 Surcharges to users and content providers for interconnection. (Blocks and hindrances to new businesses, new Internet products, innovation in general.)
  - 1.7 Manipulation of content beyond the control of customers and exceeding mandates by Federal and State governments. (Freedom of speech, throttling, adding tracking cookies, “optimization”, stripping STARTTLS from SMTP traffic, search redirection aka “hijacking”)
  - 1.8 Throttling or block of content that is “deemed” to be copyright infringement without proof, especially now that content creators are selling connections and transfers (“streaming”) to materials under copyright.
  - 1.9 Passive monitoring of, collection of, and aggregating, content (like TCP connection history, web browsing, web search history, Internet messaging, electronic mail metadata *and* content, and VoIP placed-call metadata) for the purpose of selling traffic patterns to third parties, or to generate targeted ad content. (Privacy)

- 1.10 So-call “zero rating” of traffic to be charged against a customers' transfer cap, if there is a transfer cap. (Fairness)
- 1.11 ISP interference could also introduce errors and security vulnerabilities that would be challenging to fix. (Innovation)
- 1.12 “Noncommercial broadband operators” such as private WiFi, free coffeeshop WiFi, free facility WiFi in hotels, stadiums, and other places of public assembly (competition, regulatory burden)
- 1.13 “The [Open Internet] Order contains an exception for reasonable network management. Thus, as the FCC has explained, it does not affect IPSs' ability to filter unwanted spam, computer viruses, and other malicious content of of their customers' unencrypted traffic, if the customer requests this sort of protection. Similarly, it does not bar ISPs from defending their networks against attacks.” – USCA Case #15-1063, Document #1574156, “Joint Statement of Internet Engineers and Pioneers”, page 15, citations omitted.

## Recitals

- 2) Commenter consults to a local ISP that provides broadband service to customers in Reno, Carson City, and Washoe Valley, and LTE service in the Garterville NV area.
- 3) Commenter was a participant on the APRAnet starting in 1971, and was one of the people working on Network Graphics Protocol (disclosure: never adopted)
- 4) Commenter has functioned as a network operator and electronic mail administrator for a Web hosting company

## Detailed Comments to Talking Points

- 5) (cf 2.1) Discrimination
  - 5.1 Elimination of discrimination is what new neutrality is all about. First, I take as given that each ISP wants very much to earn as much money as it can from its product offering, for itself, for its employees, and for its stockholders. The customers of each ISP wants to receive value for the money paid for the service provided, and a good experience in using the Internet. These two desires don't have to be mutually exclusive.
  - 5.2 The focus is on what the customer pays for the service. It's more than just money from customer to service, and sometimes the customer is not aware that they are not just the customer, but a *product* being sold by the ISP to others. For example, there is information that the ISP can collect and sell to third parties *that will degrade the experience for the customer*.

- 6) (cf. 2.2) Limitation of choice, monopoly and duopoly in most places
- 6.1 When you go to buy a car, there is a fairly wide choice of makers and models. Don't like the fact that Volkswagon cheated with its deisel vehicles? Choose some else. The problem with Internet service that there are very few choices, sometimes no choice at all...or at worst, no service available at an affordable rate.
  - 6.2 There are other ways that a customer can receive less than a good experience. For example, consider two customers with the same connection plan. Customer A sees a web page more slowly than customer B. Why could that be, if everything is the same?
    - 6.2.1 Customer A has a problem with his or her equipment, and needs to get it fixed.
    - 6.2.2 Customer B is using a web site owned by the ISP, or a site with a sweetheart deal with the ISP; Customer A is looking at an independent web site.
    - 6.2.3 Conversely, Customer A is looking at a web site that the ISP doesn't like, so the ISP throttles the traffic.
    - 6.2.4 A perfectly neutral reason for the differentiation would be that Customer B is looking at Web pages originating within the ISP's network, or even in the ISP's facilities (co-location) whereas Customer A is looking at Web pages that require the data traverse the ISP's uplink/crossconnects to the Internet, especially if those links are carrying substantial traffic already. Not all slowdowns are by evil intent.
    - 6.2.5 Mitigation methods for solving Customer A's slower-performance problem are described in the next section.
- 7) (cf 2.3) Network management and business management decisions co-mingled
- 7.1 What if the ISP demands “performance money” but uses its same interconnection and final-mile circuits to transfer the data? Sorry, not fair. The implementation is fairly easy for this form of throttling: using user-based rate limiting or similar technologies, you can artificially limit the amount of traffic that passes across the particular connection.
  - 7.2 What if the ISP demands that a content provider (CP) pay it money solely to access the ISP's customers, over the same interconnection and final mile links? Again, the ISP is “selling” the customer to the content provider. Remember, we are talking about prudent network management being the norm for the broadband portion of the operation.
  - 7.3 “If you want our customers to have a better user experience, you have to do something to avoid running into my downlink as a bottleneck.” The content provider (CP) can still access the customer, just not necessarily as fast as the CP would like. The ISP decides on how big a “pipe” to the Internet meets the business model for the ISP. For a CP to come in and demand that the ISP get a bigger pipe is also not fair.

- 7.4 So the answer is for the CP, once the CP's business model requires it, to make arrangements to increase the bandwidth to the ISP. One way a CP can do this is to subscribe to a content delivery network (CDN) that already has a path to the ISP. Another way is to co-locate equipment at the ISP (for a price) that buffers and caches the CP's content, so the ISP's main pipe is not used for  $n$  customers, but for one cache that then feeds those  $n$  users. Finally, the CP can have it's own CDN feeding the ISPs needing the bypass.
- 8) (cf. 2.4) Source agnostic carriage
- 8.1 The broadband ISP usually shouldn't care what's in the packets, where the incoming traffic originates, and where the outgoing traffic terminates. (One major exception: malicious traffic and attack traffic)
- 8.2 Prudent network management dictates that certain TCP and UDP ports, ports with a clear history of abuse, be blocked at the edge routers. So-called “small services” are blocked from the public Internet as a rule as part of Best Practices; other ports in edge routers are blocked because there is no legitimate public or end-user application for them. The ISPs should use a “mostly open” method of port blocking – you block only what you absolutely have to block. The use of a “mostly closed” blocking method chills new applications, new protocols, and other innovation.
- 8.3 Deep packet inspection has a few neutral uses to block certain forms of amplification attacks; as a rule, ISPs should *not* be doing deep-packet inspection of Web page traffic, FTP traffic, Voice over IP, and other end-to-end data interchange protocols.
- 8.4 Throttling or blocking based on source IPv4 or IPv6 address should be based only on Best Practices, network management of attack traffic, and in response to a Court order.
- 9) (cf. 2.5) Encryption
- 9.1 Some ISPs have actively blocked IP protocols and TCP/UDP ports used by end-to-end encryption. Few will block HTTPS (443) but may instead try to “capture” the connection in order to do content inspection. Some ISPs have blocked the ports and IP protocols used for Virtual Private Networks and similar secure-transmission services. This directly affects customers who are teleworkers, like Commenter.
- 9.2 Many such blocks exist on residential-class service; less so on business-class service.
- 9.3 These encryption blocks are particularly a problem at Commenter's day job, where such protocols are used by network engineers to access dedicated stacks of networking equipment specifically provided for training and experimental purposes, operation of which is otherwise isolated from the Internet.
- 10) (cf 2.6) Surcharges to customers and content providers to access certain services
- 10.1 This was discussed at length above.
- 11) (cf 2.7) Manipulation and modification of content

- 11.1 Users of the Internet expect the ISP to be the equivalent of a plain wire (albiet a wire of many talents). That “wire”, so the customers expect, passes data without modification and without delay, at the rate promised by the level of service they contract for.
- 11.2 Mail users expect ISPs *not* to strip STARTTLS commands in the exchange with a mail server. Doing so causes the two ends to drop back to an unencrypted connection, usually without notice or warning.
- 11.3 Customers expect their Web requests to go to the service they specify. They do *not* expect a “man in the middle” switch to another service provider. (search hijacking.)
- 11.4 Data should be transmitted faithfully. So-called “optimizations” should only be applied with the customer’s permission, and only on the traffic specifically identified for optimization.
- 11.5 Some ISP have intercepted and added “tracking cookies” to Web data without notice or warning, let alone a way to opt out. This affects privacy in that it allows for unwanted tracking of usage by the ISP and third parties.
- 12) (cf. 2.8) Copyright infringement detection, throttling, and blocking
  - 12.1 Some ISPs are trying to use technical means to detect infringement, and to slow down or stop transfers of infringing material.
  - 12.2 Now that content creators are selling streaming, it will be harder and harder for ISPs to differentiate between authorized transfers and infringing transfers.
  - 12.3 Further, these technical measures require deep packet analysis and thwarting encryption, which is an invasion of the customer’s privacy for a rapidly diminishing gain.
- 13) (cf. 2.9) Passive monitoring of, and aggregating reports of, usage
  - 13.1 Again, this is a privacy issue.
  - 13.2 Customers should not be the product. They should be the customer. Customers pay for the service, unlike radio and television which is ad-sponsered.
  - 13.3 If I as a customer don’t want to be the product, I have zero ways of opting out, *including going to another service*, because there may not *be* another service.
- 14) (cf 2.10) “Zero rating”
  - 14.1 This is a specific example of a business model decision getting in the way of prudent network management. This is the Internet equivalent of *Animal Farm*: “all animals are equal, but some animals are more equal than others”.
- 15) (cf 2.11) ISP interference a bar to innovation
  - 15.1 The interference by an ISP not only can frustrate innovation, but it can add security issues for customers. Specifically, for some traffic the ISP should *not* be doing anything but passing the bits; no monitoring, no modification, no “improving”.

- 16) (cf 2.12) Noncommercial service provision, regulatory burden
- 16.1 In most of this Comment, I've been discussing the actions of ISPs serving a large number of customers for a monthly charge. ("Large" being a little subjective, as rural customer counts could be determined with just fingers and toes...and maybe a nose.) There are operators who do not charge for use: coffeeshops, restaurants, bookstores, stadiums, auditoriums, hotels.
  - 16.2 Regulating "free" service means that the person offering the service solely bears the burden of the cost of such regulation.
  - 16.3 Also, a number of private individuals operating wireless networks (WiFi) within their home, and solely for their use.
  - 16.4 Therefore, any regulation should apply only for the for-profit operators.

## Comments on the Draft NPRM, FCC-CIRC1705-05

- 17) At 4: "The Commission's Title II Order has put at risk online investment and innovation, threatening the very open Internet it purported to preserve."
- 17.1 The original "very open Internet" consisted of "network of networks", each network relatively small in size, and with lots of competition among access providers. For example, in Reno I had my choice of seven different ISPs when I first moved here 15 years ago. Today, there are only four. Broadband is outsourced by at least one of the surviving ISPs to the duopoly.
  - 17.2 So the Internet scene has transitioned from a healthy competition to a duopoly, or in many places a monopoly. *Or nothing at all.*
  - 17.3 Title II was the vehicle that the FCC used for years with monopolies. Title II is a very blunt instrument, especially when it's used on every single ISP, large and small. You need a better scalpel to narrow your network neutrality focus to monopoly ISPs. And anti-trust isn't the answer, because many of the monopoly ISPs operate as part of other monopoly services, that share the monopoly infrastructure. That's why they can continue to operate *as monopolies*.
  - 17.4 For example, the FCC in past rulings required that the telephone company "unbundle" network elements, permitting access by entities outside of the telephone company access to those elements. DSL is an excellent example of such an unbundled element: the ISP purchases equipment and a dedicated leased line to the telephone company, and the telephone company in turn connects channels in that equipment to the Digital subscriber line access multiplexer (DSLAM) connected to the customer's telephone line.
  - 17.5 There is no such requirement on the cable TV companies, and therefore no access to the network elements to independent ISPs. In my experience, the "answer" was for the independent ISP to resell the cable-TV system's Internet access service. The customer of resold service suffers at the whims of the cable-TV's ISP, as though that customer was contracting with the cable-TV ISP itself. Only the billing and support differs.

- 17.6 So in trying to deal with ISPs who exclusively “own” the facilities otherwise covered by Title II – specifically the cable-TV cable plant – the FCC’s “Title II rules” roped in ISPs that did not have such facilities that are a monopoly service. Remember that most areas require that a cable TV company sign an exclusive franchise agreement with local government, locking out any competition.
- 17.7 Trying to create a “one size fits all” rule is what led to what you describe: “Internet service providers have pulled back on plans to deploy new and upgraded infrastructure and services to consumers. This is particularly true of the smallest Internet service providers that serve consumers in rural, low-income, and other under-served communities.” (NPRM at 4)
- 18) at 5: “Today, we take a much-needed first step toward returning to the successful bipartisan framework that created the free and open Internet and, for almost twenty years, saw it flourish.”
- 18.1 That return to the bipartisan framework can be possible only if anti-trust action is taken on some of the monopoly broadband providers, or the rules recognize that there are monopoly ISPs and non-monopoly ISPs.
- 18.2 Another option is to specifically permit local governments to deploy municipal broadband. Many state current block the local governments from offering Internet broadband access. There is little incentive on the part of private business to build the necessary facilities infrastructure to compete against the monopoly broadband companies – there just isn’t the return for the investment. Perhaps, in face of State law, there is a way for an NGO to be able to contract to provide municipal broadband as part of a package of networking for government offices and schools, and other government-owned facilities.
- 18.3 The exception to negative effects of ISPs servicing rural settings is wireless. The ISP to which I consult is currently launching to serve a rural section of Nevada – *and under the current rules that are in place.*
- 19) At 10: “For the next 16 years, the Commission repeatedly followed their advice, opting for a light-touch approach to the Internet that favored discrete and targeted actions over traditional preemptive, sweeping regulation of Internet service providers.”
- 19.1 I lived through those early years as a modem user. There was a point where the telephone companies were going to reclassify residential phone lines being used with modems to business class, with the bump in monthly rate, because modem use disrupted the usage assumptions and model developed by the phone companies. There were other activities that caused ISPs with phone banks to become ILECs. And other foolishness.

- 19.2 For those 16 years, we didn't have monopolists acting as the gatekeepers to the Internet. We had national companies such as America ("You've got mail!") Online, the Byte Information eXchange, the WELL, and others that provided Internet access through their systems in a competitive marketplace. We had private ISPs springing up everywhere, providing dial-up service for a reasonable fee (once the telcos stopped trying to cash in), again in a competitive marketplace. For those people needing leased-line service, such as businesses and banks, there were ISPs that would lease circuits from the phone company and then tie those T1's into the Internet.
- 19.3 Dial-up has virtually disappeared. So have Part 68 PSTN modems in computers.
- 19.4 So the focus of network neutrality should not be "Internet Service Providers" as a class. It should focus on monopoly providers, particular providers who take advantage of franchise agreements and other government instruments to lock out their competition.
- 20) At 15: "The Internet Policy Statement announced the Commission's intent to 'incorporate [these] principles into its ongoing policymaking activities' in order to "foster creation, adoption and use of Internet broadband content, applications, services and attachments, and to ensure consumers benefit from the innovation that comes from competition."
- 20.1 Competition. That is the key word. We don't have competition. We have two players, one hanging fiber/coax and the other hanging fiber/copper on the nation's telephone poles or in cable tunnels. The cost of entry and the risks of trying to duplicate the physical plant to compete with those two players is too rich and too dangerous to attract anyone. Even a player with the market cap of Google is having trouble deploying competing fiber product, particularly when existing monopoly ISPs fight tooth and nail in Courts to prevent deployment. I consider that anti-competitive activity, which the FCC should consider referring to the FTC.
- 20.2 Wireless is not necessarily the answer in suburban and urban environment. Spectrum allocations are tight, and the co-interference using unlicensed bands is already too high. (Think LTE cellular versus WiFi.)
- 20.3 DSL was one answer, because the ATM connection services were made available to ISPs so that those ISPs could compete with the telephone company. Here in Reno, Nevada Bell is phasing out service of the DSLAMs that are a central part of DSL service, in favor of fiber.
- 20.4 Here is a challenge to the Commissioners: describe how any new entity can compete as a facilities-based provider against the cable company and the phone company with even a one-percent (1%) chance of success.
- 21) At 18: "Comcast's actions 'contravene[d] . . . federal policy' by 'significantly impeded[ing] consumers' ability to access the content and use the applications of their choice.'
- 21.1 This is the heart of the net neutrality discussion, in my view. What federal policy?



- 22) At 25: “Our proposal to classify broadband Internet access service as an information service is based on a number of factors. First, we examine the text, structure, and history of the Communications Act and the Telecommunications Act, combined with the technical details of how the Internet works. Second, we examine Commission precedent. Third, we examine public policy and our goal of benefiting consumers through greater innovation, investment, and competition. We seek comment on our proposals and these analyses.”
- 22.1 When you examine the history, you need to include studies of the population distribution of the ISP players at the beginning of the Internet Age, versus the population distribution of the ISP players today. You will see that there has been a huge die-off of independent ISPs, lots of consolidation and buy-outs, and the use of monopoly status in telephone and cable to leverage positions in the broadband arena. Indeed, independent ISPs are reselling monopoly service in order to be able to offer transfer speeds in excess of 10 megabits/second. This outsourcing masks the competitive nature of each marketplace; just because there are, say, dozens of ISPs, the reality is that one or two facilities providers actually provide the service.
- 22.2 The Internet is *supposed* to work by network operators in different administrative domains (companies, organizations, utilities, institutions) co-operating with each other to provide connection service to customers.
- 22.3 Commission precedent applies to a structure of the Internet from long ago.
- 22.4 Customers benefit when they *know* that the Internet they are buying is a great big “wire” with some behind-the-curtain switching smarts.
- 22.5 Innovation can happen when the ISPs provide that great big “wire” with some behind-the-curtain switching smarts.
- 22.6 One Commission precedent, to the telephone companies, is that the monopoly telephone provider provide equal access to network elements. That precedent can be extended to the cable TV companies in some manner, to remove the bundling of facilities access and ISP access service.
- 23) At 27: “We believe that Internet service providers [ISPs] offer the 'capability for generating, acquiring, storing, transforming, processing, retrieving, utilizing, or making available information via telecommunications.'”
- 23.1 No. You are describing the Internet *marketplace*, and not the ISP's offering, or the Internet itself.
- 23.2 The chief function of an Internet Service Provider (ISP) is to provide a data path from a customer's computer that is running an application to remote instances of applications on the the network of networks. Nothing more, nothing less.
- 23.3 The Internet doesn't store anything (other than buffering packets in transmission). Application servers store the data, servers that are connected to the Internet. Users can acquire, store, transform, retrieve, utilize, or gain availability by requesting the applications servers to do so, the requests going over the Internet, and responses being transferred back over the Internet to the users.

- 23.4 ISPs, as the network manager, does not do any of these applications. Other divisions of *the same company* can, but the instances of applications and “the network” are separate.
- 23.5 In the past, ISPs would offer limited applications services, such as electronic mail, file storage, and Web sites. This was so the ISP could offer a “one stop shop” for common services. The reason was that the competition in the pre-Internet days – Compuserve, GENie, AOL, and others – provided dial-up service into their servers that run applications like bulletin boards, mail, “chat rooms”, news feeds, stores, and other information services.
- 23.6 The Internet market place has moved away from a vertical product paradigm, moving to a horizontally-distributed product paradigm:
- 23.6.1 News has moved to newspapers, radio, television, and wire services. In the old days, these sources would provide “feeds” to the information services. With the Internet, the news sources deliver their content directly.
  - 23.6.2 Internet messaging, such as HipChat and Microsoft Messenger have in part replaced the chat rooms of old.
  - 23.6.3 Bulletin boards, discussion boards, and “chat services” are now done using Web sites hosted at Web hosting companies – many ISPs no longer offer Web service because it's a money-loser for the ISP, not having enough volume – or on privately maintained servers, as in a technical support chat service that a software or equipment vendor would offer.
  - 23.6.4 Stores have moved to their own Web sites, independent of ISPs. Many brick-and-mortar stores are finding new life as Web destinations...sometimes closing the storefront.
  - 23.6.5 ISPs provide e-mail (either in-house or – more and more – outsourced) because e-mail is still considered “part of the package”. But more and more e-mail is being done elsewhere: Google Mail and other “freemail” players, outlook.com, and others. Many businesses, corporations, and organizations use their own e-mail servers.
  - 23.6.6 Even Hillary Clinton had her own e-mail server in her basement.
  - 23.6.7 FYI, my mail server used to be in the kitchen of my apartment. Now it has been moved to a spare bedroom.
  - 23.6.8 On-line repositories have become the province of government, universities, and institutions that collect, store, and offer searches over vast amounts of information. Web search is Google, Bing, and as of this writing Yahoo, among other smaller players.

23.6.9 Streaming content like television shows and movies are not part of the ISP's task of moving data over a "wire", but some monopoly ISPs are owned by the owners of such television shows and movies. Some ISPs are also cable companies, looking at the Internet as competition to their core business, providing television signals for a fee. "Cord-cutting" is cutting into the profits of those cable companies, which is why those ISPs who are also cable companies look to diminish the customer's experience watching flicks via Internet instead of via cable channels.

- 24) At 27: "Can broadband Internet users indeed access these capabilities? Are there other capabilities that a broadband Internet user may receive with service? If broadband Internet access service does not afford one of the listed capabilities to users, what effect would that have on our statutory analysis? More fundamentally, we seek comment on how the Commission should assess whether a broadband provider is "offering" a capability. Should we assess this from the perspective of the user, from the provider, or through some other lens?"
- 24.1 Access capabilities: If the ISP is offering "the whole Internet" and not a filtered experience, your questions have easy answers – yes, customers can pretty much access everything.
- 24.2 Other capability offerings: Maybe, but not from the Internet Service Provider network operations, but from another part of the same company
- 24.3 Not afford one of the listed capabilities: There would be no effect on your statutory analysis. If the customer is full-tilt-boogey on the Internet through the ISP, that customer can get to any capability/application/service he/she wants.
- 24.4 Does the customer have unfiltered, unmonitored access to the Internet? If "yes", then the FCC is done.
- 24.5 The only lens is whether the customer can use any application he/she wants over the "wire", without throttling, blocking, or manipulation by the ISP.
- 25) At 28: "We seek comment on how consumers are using broadband Internet access service today. It appears that, as in 2002 and 2013, broadband Internet users "obtain many functions from companies" other than their Internet service provider. It also appears that many broadband Internet users rely on services, such as Domain Name Service (DNS) and email, from their ISP. Is that correct? If not, what services are broadband Internet users accessing from what providers? More generally, we seek comment on the relevance of this analysis."
- 25.1 DNS – Depend on the ISP. Depends on the user. I know that the customers for the ISP I consult to have been told to use 8.8.8.8 and 8.8.4.4 – Google's public DNS – for their DNS service. The only use for that ISP's DNS is to announce A records for the Web services and mail services the ISP offers. (Long story.)
- 25.2 I run my own caching DNS server. It's just easier that way – for me, experienced in network administration and with a pile of computers. I need the local DNS server so that my mail server can cache the most common e-mail source domains. (See next)

- 25.3 Because of the spam problem, very few ISPs have the BOFH (bastard operator from H\*!!) mail administrators to enforce anti-spam policies to stay out of anti-spam blocking lists. So users who care about their mail bypass the ISP mail and go with Google or other mail services. I run my own mail server at home, because I *know* what goes out over my fixed IP address. (I also want to keep third parties other than the recipients touch my e-mail in any way.)
- 25.4 By the way, a side note on spam blocking techniques. Many mail administrators opt in to using so-called DNSBLs (DNS-based blocking lists) for their mail servers, a service that is a reporter, not unlike the Better Business Bureau, of known problem sources of spam. Companies such as Penguin provide mail-filtering services that will detect and remove common spam before the e-mail ever reaches the mail admin customers' servers. ISPs may subscribe to one or more of these services in their offerings, as can any mail administrator trying to “clean up” the incoming mail feed.
- 25.5 Web sites are pretty much all hosted at, or outsourced by ISPs to, specialty Web hosting companies.
- 25.6 ISPs rarely get involved with Voice over IP telephony service. (Cable has their own way of doing telephony over cable separate from their Internet offerings.) There are specialty companies who offer VoIP services and support. Some brave souls roll their own.
- 26) At 29: “In contrast, Internet service providers do not appear to offer 'telecommunications,' i.e., 'the transmission, between or among points specified by the user, of information of the user's choosing, without change in the form or content of the information as sent and received,' to their users. For one, broadband Internet users do not typically specify the “points” between and among which information is sent online. Instead, routing decisions are based on the architecture of the network, not on consumers' instructions, and consumers are often unaware of where online content is stored. Domain names must be translated into IP addresses (and there is no one-to-one correspondence between the two). Even IP addresses may not specify where information is transmitted to or from because caching servers store and serve popular information to reduce network loads. In short, broadband Internet users are paying for the access to information 'with no knowledge of the physical location of the server where that information resides.’”
- 26.1 By your reasoning in your question, the telephone company doesn't provide “telecommunications” either. Telephone users do not – indeed cannot – typically specify the “points” between and among what connections are established. Instead, routing decisions are based on the architecture of the telephone network, and the loading on the trunk lines; and, callers are often unaware of where telephone connections end up. (Think 800 numbers and FXO service.) Telephone numbers must be translated into line/frame/office locations (and there is no one-to-one correspondence between telephone numbers and the physical termination points). In short, telephone users are paying for the connection to telephones “with no knowledge of the physical location of the telephone where the called party resides.”

## 26.2 Let's clear up some misconceptions.

- 26.2.1 There are a surprising number of parallels between how the Internet works and how the international telephone system works. In the description following, I'll include a **note** where there are analogous elements)
- 26.2.2 The customer is assigned a unique Internet Protocol (IP) address, which is either a 32-bit or 128-bit number. This is the number sent by the sender on every outgoing packet, telling the “other end” where to send return packets. This number may be permanently assigned (“fixed address”) or allocated dynamically. This number assignment is a function of the ISP. (**Caller's telephone number**)
- 26.2.3 Every other active node on the Internet is assigned, in some way, a unique 32- or 128-bit number. There are several mechanisms for obtaining numbers: directly from ARIN, directly from a IP-block broker, assigned by a network administrator, or “leased” temporarily via DHCP (Dynamic Host Configuration Protocol) servers operated by an entity (not necessarily an ISP) who “owns” IP address blocks. (**Called number**)
- 26.2.4 Because numbers are hard to remember, most – but not all – applications instead use a tree-based, distributed, domain-name look-up directory, called the Domain Name System, or DNS. (**Telephone book**) Users don't necessarily have to use DNS; in fact, in some programs and systems, the name-to-IP-address conversion is performed within the user's computer system, using a datafile called /etc/hosts (Unix, Linux, BSD, &c) or a similar file (Windows, OS/2, &c). (**Private telephone book**)
- 26.2.5 When the sender makes a request to a server, he indicates his/her desired destination by specifying either the IP address directly, or a domain name that is then translated to an IP address. For the rest of this discussion, we will assume the request is in one packet
- 26.2.6 The sender's computer launches the packet through the final-mile connection to the ISP. The ISP sends the packet to a *router*, which has a table saying out of which port to send the packet, based on the IP address. (**local office**)
- 26.2.7 The router sends to the next router, which makes a decision on which port to send the packet, based on the IP address. This is repeated as many times as necessary. (**toll offices**)
- 26.2.8 The packet makes it to the final router, which then send the packet over the final mile like to the destination. That destination could be a network, where it comes in a router and gets passed until it gets to the server. (**far-end local office**)
- 26.2.9 The server processes the request contained in the payload of the IP packet, and sends a response back the way the request came. That response packet then goes through the same step-by-step process to get back to the original sender.

- 26.2.10 Because conditions change on the Internet constantly, the routers *may* use other routings, just as the telephone system can use other trunks to route a call. To do this, routers constantly talk to each other about the network; a given router will broadcast to its neighbors the “weather report” seen by the router, both directly and from other routers.
- 26.2.11 And that's it. Telecommunications through a network of networks that can adjust, on the fly, to changes: link loads, router failure, line cuts, “backhoe disconnections”, someone pulling a plug.
- 26.3 Just as phone calls can be call-forwarded, or go through call directors, the telephone caller doesn't know where the called party is, physically. He or she just wants whatever the called party has to offer.
- 26.4 So the sender doesn't necessarily care where the endpoint he is pointing to is, he just wants to know it's the right party.
- 27) From 29: “How are broadband Internet users’ requests for information handled by Internet service providers today? What functionalities beyond mere transmission do Internet service providers incorporate into their broadband Internet access service? We particularly seek comment on the Title II Order’s assertion that the phrase “points specified by the user” is ambiguous —how should we interpret that phrase so that it carries with it independent meaning and is not mere surplusage? Is it enough, as the Title II Order asserted, for a broadband Internet user to specify the information he is trying to access but not the “points” between or among which the information will be transmitted? Does it matter that the Internet service provider specifies the points between and among which information will be transmitted?”
  - 27.1 How requests are handled: I described it above.
  - 27.2 What functionalities beyond transmission are incorporated into their access service? Just about all ISPs offer some form of e-mail, either in-house or outsourced. Every ISP tells its customers how to configure the DNS process, the “resolver”, in their computers, with the provided numbers going either to ISP DNS servers, or to outsource DNS servers.
  - 27.3 Other parts of the same company as the ISP can provide other services, but that's not part of the ISP's core function
  - 27.4 Title II Order’s assertion that the phrase “points specified by the user” is ambiguous – all the user specifies is the ultimate destination, just like a telephone caller specifies the ultimate desired called party. Any intermediate packet switching is not under the sender's control, just as a phone caller has no control what specific trunks are used calling NYC from Washington DC. Just as a company can have “tie lines” that bypass the switched network, that company can have private links between locations, in addition to access to the Internet. Perhaps referring to the sender as “one endpoint” and the desired destination is the “other endpoint” would clear up any ambiguity. “Points” as a plural isn't specific enough.

- 27.5 Is it enough, as the Title II Order asserted, for a broadband Internet user to specify the information he is trying to access but not the “points” between or among which the information will be transmitted? – Yes. Network operators may care about the routing of a packet, to avoid high cost links, but this is invisible to the broadband user.
- 27.6 Finally, the Title II Order should apply *only* to ISPs that have facilities that are already covered under Title II – the wireline telephone companies and the cable-TV companies that offer their services over those same facilities, while not making those facilities available to other entities.
- 28) At 29: Does it matter that the Internet service provider specifies the points between and among which information will be transmitted?
- 28.1 This question makes assumptions that are false to fact. The ISP does not determine the intermediate points. The switch decisions are done at *each and every router* along the path. Some routers, but not necessarily all, are “owned” by the ISP.
- 28.2 Some of the routers would be owned by an inter-exchange carrier. Some routers the packet passes through could reside outside of the United States and its territories. Yes, packets sourced from and destined for CONUS endpoints can and do leave the country *and come back* in certain circumstances. Packets could be routed through satellite links. The customer could have a network, with its own routers, as could the party at the other end of the connection.
- 28.3 In short, the ISP is a co-operating peer partner in this network-of-networks.
- 28.4 Here is how Heather Clifford and I described the packet routing process in our book, *Linux IP Stacks Commentary*:

Before the data goes anywhere, it has to be properly “gift-wrapped”. In the Internet, the bow-adorned object is an IP packet, which consists of a box with data inside, wrapping paper to ensure that the data stays together, and a tag that states who is sending the packet and who is supposed to receive it. Unlike the typical recipient of a holiday gift, the intended recipient of an IP packet can be miles, or continents, away, and the IP tag tells you absolutely nothing about how to get the package to the right giftee.

... Back to your gift-wrapped data package. The IP packet starts out from its point of origin in Truth Or Consequences, New Mexico. The first router that your packet reaches on the Internet contains a collection of hints in its routing table, gathered from its neighboring routers, that suggests the best way to forward a packet toward Ouagadougou [Burkina Faso, on the continent of Africa]. (In the data-transmission world, “best way” may mean any of several things. It might be either the fastest way to send information, the method that’s cheapest in terms of resources or money, the route that’s

the least sensitive politically, or the pathway that's the least likely to damage [or delay] the data.)

The first router sends your package to a second router which, with luck, is located well along the way toward your package's destination. This second router then makes *its* best guess about how to pass the data, and speeds the package on its way toward the next router. This process continues until the package reaches its destination in Ouagadougou and the recipient opens it. In the very worst case, the package never gets to Ouagadougou. Instead, it hits a digital dead-end and is dumped unceremoniously into a bit-bucket. – *Linux IP Stacks Commentary*, ISBN 1-57610-470-2, pg 488-9

- 29) at 30: “What constitutes a “change in the form” of information? If not the protocol-processing for internetworking—considered an enhanced service under the Computer Inquiries—how should we interpret this phrase so it carries with it independent meaning and is not mere surplusage? How could we plausibly conclude that it is not a “change in the . . . content” to use of firewalls and other reasonable network management tools to shield broadband Internet users from unwanted intrusions and thereby alter what information reaches the user for the user’s benefit? We seek comment on other ways in which Internet service providers change the form or content of information to facilitate a broadband Internet user’s experience on line.”
- 29.1 Change in the form of any information: Any addition, subtraction, or replacement of data in the payload of the IP packet(s). Using the gift-package example above, any change that requires the “package” to be “unwrapped”.
- 29.2 Try using the phrase “modification of the data in the payload of a datagram or a stream.”
- 29.3 The definition can be expanded to include the non-payload information, that forms the wrapper for the packet, that is added/subtracted/replaced in manners not defined by the Internet standards. By “Internet standard” I refer to the documents collectively called the “Internet RFCs”. There are manipulations of packet metadata that are neutral and that form part of prudent network practices, while there are other, nonstandard ones that are, um, not neutral.
- 29.4 For Web sites, this includes things like adding or removing cookies, and adding HTML to display an ad or other purpose. For e-mail, it's removing STARTTLS. For video, it's any modification like resizing, cropping, compressing, reducing color levels, or watermarking.
- 29.5 Firewalls that do not do deep-packet inspection for the purpose of modifying the payload of the packets it examines is a neutral proper and prudent network practice. Shielding customers from unwanted intrusions is also proper neutral network practice. Blocking service without regard to current and future applications is *not* neutral network practice. Firewalls must be designed with “mostly-open” design principles, to avoid (as much as practical) blocking future uses of the network.



- 29.6 Redirecting requests from the intended destination to an astonishing (to the customer) destination is not a neutral network practice.
  - 29.7 Intercepting and compromising HTTPS negotiation for the purpose of deep content inspection is not a neutral network practice. In fact, security people have a term for this action: “Man in the middle attack”. Performing such “main in the middle attacks” in general to defeat encryption is absolutely not a neutral network practice, and in fact when it's done wrong it can expose information like credit card numbers, Social Security number, and other sensitive data to anyone who looks at the packets as they fly by, anywhere in the path from the miscreant to the ultimate destination.
  - 29.8 By the way, many of the practices noted by others in the original discussion of network neutrality do *not* “facilitate a broadband user's experience on line” – they serve the ISP's interest, not the customers.
- 30) At 31: “On its face, the plain language of this provision deems Internet access service an information service. We seek comment on this analysis, on the language of section 230, and on how it should impact our classification of broadband Internet access service.”
- 30.1 Internet service per se should be an information service.
  - 30.2 Broadband service offered over facilities owned by the ISP and not “unbundled” should be separated into a separate category, which I call “monopoly information services” and Title II rules attached to this new category.
  - 30.3 The issue isn't whether Internet service in and of itself is classified correctly, it is dealing with the issues raised by monopoly providers, for it's the monopoly providers that cause all the trouble with the non-neutral things they do.
  - 30.4 Smaller ISP's, and especially those facing significant competition, *just don't do these things*.
- 31) At 32: “Section 231 is even more direct. It expressly states that “Internet access service” “does not include telecommunications services.” And it defines Internet access service as one offering many capabilities (like an information service): “a service that enables users to access content, information, electronic mail, or other services offered over the Internet, and may also include access to proprietary content, information, and other services as part of a package of services offered to consumers.” 79 Although inserted into the Communications Act one year after the Telecommunications Act's passage 80 and previously interpreted to “clarify that section 231 was not intended to impair our or a state commission's ability to regulate basic telecommunications services,” this language on its face makes clear that Internet access service is not a telecommunications service. We seek comment on this analysis, on the language of section 231, and on how it should impact our classification of broadband Internet access service.
- 31.1 I think I see the biggest problem and the source of some of the disconnects in discussions between Internet experts and the FCC: In government circles, the word “telecommunications” implies a existence of a service supplied exclusively by monopolies.

- 31.2 Internet service is not supplied exclusively by monopolies, but by companies of all sizes and coverage, with varying levels of competition and varying levels of monopoly status.
  - 31.3 Also, Section 321 conflates “Internet” with “Internet Market”.
  - 31.4 So you need *three* classifications to properly deal with all this: monopoly telecommunications, monopoly information services, and non-monopoly information services
- 32) At 37: Second, the Title II Order found that DNS and caching used in broadband Internet access service were just used “for the management, control, or operation of a telecommunications system or the management of a telecommunications service.” The Commission has previously held this category applies to “adjunct-to-basic” functions that are “incidental” to a telecommunications service’s underlying use and “do not alter [its] fundamental character.” As such, these functions generally are not “useful to end users, rather than carriers.” We seek comment on how DNS and caching functions are now used, whether they benefit end users, Internet service providers, or both, and whether they fit within the adjunct-to-basic exception. How would broadband Internet access service work without DNS or caching? Would removing DNS have a merely incidental effect on broadband Internet users, or would it fundamentally change their online experience? Absent caching, would broadband Internet users that now expect high-quality video streaming see only incidental changes or more fundamental changes? Are there other ways that DNS or caching are used for “for the management, control, or operation of a telecommunications system”?
- 32.1 DNS is *very useful* to the customer. The use of names instead of numbers is key to the acceptance of the Web by the general public. Without DNS, the Internet would not be as ubiquitous as it is today. Frankly, the carriers use DNS just as much as the users do – ask any network engineer who has a fleet of routers to maintain, especially when the fleet is all over the country or around the world.
  - 32.2 Removing DNS would fundamentally change their online experience – just ask any user of eBay, Amazon, or Google. The ISP not offering DNS servers in-house, on the other hand, would have no effect on the user online experience...as long as the user is given addresses to a DNS server *somewhere*.
  - 32.3 Frankly, the Title II order finding is wrong re DNS. Remember that the Domain Name Service is to the Internet as the **telephone book** is to **phone service**. Just as you have dozens of telephone books throughout the nation, and even more throughout the world, you have a very large, distributed count of DNS servers throughout the world. Think about *Fahrenheit 451*: how useful would the telephone be if every telephone directory, including your private one, were burned?
  - 32.4 There are two classes of DNS servers: “recursive” servers that will perform a lookup on the 'Net on behalf of a client, and “authoritative” servers that provide the exact definitions for all the elements of a domain name and its sub-names.

- 32.5 One major source of confusion: the BIND name server software, and perhaps other DNS server software, can be configured to perform both services at the same time in the same server. Combining the functions into one server makes sense for small operators; for larger operators with competent network administrators, the two functions reside in small (or large) “farms” of DNS servers.
- 32.6 So, in dial-up and broadband access server, the DNS server is just a “phone book” provided by the ISP for the customer. Or not; the customer can configure his/her equipment to use a different DNS service of his or her choice.
- 32.7 With respect to each specific ISP, DNS is incidental, because the customer can get domain name service from other public DNS servers such as Google, or the customer's computer can run its own recursive DNS server. For example, I have broadband with Charter Cable, and I chose not to use Charter's DNS servers but use Google and my own. For the vast majority of broadband users, the ISP needs to provide DNS information, but not necessarily for their own servers.
- 32.8 “Caching” is such a broad term. Your footnote clarifies that you are referring to Web page caching. Web caching was popular with certain large ISPs, because they had relatively small pipes to the Internet, so the use of a Web cache like “Squid” reduced the flow on the small uplink pipes. The problem is that with the growth of Web programmers using languages like PHP, Perl, and Python (to mention three), pages are becoming more dynamic; that is, the content *changes* for each request. Associate that with the trend toward forcing everyone to use HTTPS to eliminate data leakage, and Web page caches are providing rapidly diminishing returns for their using ISP.
- 32.9 Now, encryption breaks most caching systems. As mentioned earlier, an ISP can perform a “man in the middle attack” against the customer's requests, thereby *removing* the encrypted transaction. Such attack systems that are nice will establish an encrypted connection to the ultimate destination...but not all do.
- 32.10 Another form of caching some large ISPs have used is DNS caching. It works like this: the first time someone asks for <http://fcc.gov>, the DNS server would look up the name and return the IP address. Now, when I'm writing this, the TimeToLive on [fcc.gov](http://fcc.gov) is 20 seconds. (That's rather nasty of your IT people, by the way, to have such a short TTL.) Now, a regular recursive server will keep that record, which in this case dies in 20 seconds. Said large ISP with the small pipe will instead *ignore* the TimeToLive from the FCC's zone file, and instead insert the [fcc.gov](http://fcc.gov) record with a TimeToLive of 604800 seconds – or one *week*.
- 32.11 There are additional possible caching systems in the Internet, but that discussion is beyond the scope of your question.

- 33) From 42: “We believe Internet traffic exchange, premised on privately negotiated agreements or case-by-case basis, is not a telecommunications service.”
- 33.1 I agree. It is a non-monopoly information service. There are a number of inter-exchange carriers out there; all you need is access to a “telco hotel” via a leased-line link and you have your choice of any number of them. Inter-exchange service has healthy competition already baked in.
- 33.2 Interestingly, some of the large ISPs also function in the inter-exchange market. They don't pull their stunts on those customers.
- 33.3 I haven't experienced any neutrality problem with *any* of the inter-exchange carriers. Others may have different experiences, so don't take my statement as gospel.
- 34) At 43: “We note that the Commission’s Title II Order also went well beyond agency precedent in important ways. For instance, the Commission did not limit its analysis to the “last mile” connections at issue in the Brand X and the FCC’s underlying proceeding in that case. Rather, the Commission’s Title II Order defined Internet access service as extending far deeper into the network. We seek comment on the significance of this expansive departure from agency precedent.”
- 34.1 Network neutrality can be compromised *anywhere* from the user to his desired destination. Packets can easily go through half a dozen administrative domains before landing at the desired endpoint. And even more devices: routers, switches, firewalls, security appliances, flow limiters, bloated buffers (but that's for another time), and I-don't-know-what-all.
- 34.2 The fact is, almost all of the malicious acts that I've seen documented have taken place in, or near, the final mile link or the wireless equivalent, in those ISPs who compromise network neutrality for whatever reason. Between the two gatekeepers, the network is pretty neutral.
- 34.3 One good reason that going deeper into the network was reasonable is that violation of network neutrality can occur *anywhere* in the path between the customer and the ultimate end-point of a connection. Known culprits of net neutrality violations tend to be closer to the “final mile” – the guys in the middle just don't pull the stunts that the guys at the edges do. Also, the entities in the middle tend *not* to be monopolies.

- 35) At 50: “We also seek comment on specific ways in which consumers were harmed under the light-touch regulatory framework that existed before the Commission’s Title II Order. Much of the Title II Order focused extensively on hypothetical actions Internet service providers “might” take, and how those actions “might” harm consumers, but the Title II Order only articulated four examples of actions Internet service providers arguably took to justify its adoption of the Internet conduct standard under Title II. Do these isolated examples justify the regulatory shift that Title II reclassification entailed? Do such isolated examples constitute market failure sufficient to warrant pre-emptive, industry-wide regulation? Were pre-existing federal and state competition and consumer protection regimes, in addition to private sector initiatives, insufficient to address such isolated examples, and if so, why? What are the costs and benefits of pre-emptive, industry-wide regulation in such circumstances? In particular, does that approach deter competition and competitive entry, and does it have unintended consequences with respect to infrastructure investment? Do those unintended consequences outweigh any purported benefits in addressing such isolated cases pre-emptively? Is there evidence of actual harm to consumers sufficient to support maintaining the Title II telecommunications service classification for broadband Internet access service? Is there any evidence that the likelihood of these events occurring decreased with the shift to Title II?
- 35.1 Specific harm: customers received a filtered and interrupted internet experience, without cause, from the ISPs who use facilities “owned” by them, those facilities *already covered under Title II*. The fact that such monopoly ISPs have an undue market lock means that customers don't have other options.
- 35.2 Lumping monopoly ISPs and non-monopoly ISPs under Title II was overbroad.
- 35.3 Monopoly ISPs are not subject to pre-existing federal and state competition and consumer protection regimes, nor private sector initiatives, because the facilities monopoly is sanctioned by government, and in the case of cable TV with no specific controls on Internet services in the cable service area – the franchise agreements are silent on this issue.
- 35.4 Regarding harm, I go into the harm caused by unbridled monopoly ISP action in the first part of this Comment, so I will not repeat it here.
- 35.5 Title II is a very, very large hammer that strikes at way too many players. The “problem children” tend to be monopoly or duopoly information service players, taking advantage of the customers' inability to “vote with their feet and pocketbook” to be able to force their will on said customers. So the right way to do this is to identify the difference between monopoly and non-monopoly information services, and regulate the former under Title II – the Title used to regulate the monopoly telephone companies – or something like it. Leave the competitive information service people alone.
- 35.6 WHAT competition? With the monopolies and duopolies, there is insufficient competition for service.
- 35.7 In other words, don't go industry-wide. Just impose the regulations on the monopoly companies.

- 35.8 No, Title II is not appropriate for all broadband information service, just monopoly broadband information service.
- 36) At 67: “We propose to return jurisdiction over Internet service providers’ privacy practices to the FTC, with its decades of experience and expertise in this area. We seek comment on this proposal.”
- 36.1 Yes. Just yes. As long as the resulting rules recognize there is a difference between monopoly information service providers and the non-monopoly information service providers.
- 37) At 76: “In the Title II Order, despite virtually no quantifiable evidence of consumer harm, the Commission nevertheless determined that it needed bright line rules banning three specific practices by providers of both fixed and mobile broadband Internet access service: blocking, throttling, and paid prioritization. The Commission also “enhanced” the transparency rule by adopting additional disclosure requirements. Today, we revisit these determinations and seek comment on whether we should keep, modify, or eliminate the bright line and transparency rules.”
- 37.1 First, it would appear that going away from Title II is the right thing to do. In order to make regulations that have the impact you desire, you will need to differentiate between monopoly information services, and non-monopoly information services.
- 37.2 Blocking, throttling, and paid prioritization in the monopoly land-based broadband business should be retained. There is insufficient competition for the market to do the job.
- 37.3 Mobile is an open question in my mind. As I see it, there is considerably more competition in the mobile marketplace than there is in the land-based broadband, so allowing the rules as listed to apply only to mobile monopoly players, if there are any, appears reasonable.
- 38) At 80: “We seek comment on the continuing need for a no-blocking rule. The no-blocking rule, originally adopted in 2010, invalidated by the Verizon court, and re-adopted in the Title II Order, prohibits Internet service providers from blocking competitors’ content by mandating that a customer has a right to access lawful content, applications, services, and to use non-harmful devices, subject to reasonable network management.”
- 38.1 Again, the issue comes up only with monopoly information service players; non-monopoly information service players are kept in line by market forces.

Respectfully submitted for your consideration,  
Stephen Satchell

Electronic mail regarding this Comment may be sent to the “wc-17-108” mailbox at my mail domain, “satchell” (dot) “net” for immediate processing. Mail to the registered e-mail address associated with this Comment is a “catchall” and thus e-mail addressed there will experience delays in processing.